

CLAIMS

1. A method of laser-marking comprising exposing a substrate comprising a high luster bismuth oxychloride to a laser creating a laser-mark, with the proviso that the substrate is not an unsaturated polyester cross-linked with a styrene monomer.
2. A method according to claim 1, wherein the substrate is a polyolefin, a polyamide, a saturated polyester, a saturated polyester ester, a polyether ester, a polyphenylene ether, a polyacetal, a polybutylene terephthalate, a polymethyl methacrylate, a polyvinyl acetal, a polystyrene, an acrylonitrile-butadiene-styrene, an acrylonitrile-styrene-acrylate, a polycarbonate, a polyether sulphone, a polyether ketone, a copolymer thereof, or a mixture thereof.
3. A method according to claim 1, wherein the high luster bismuth oxychloride comprises a plurality of generally platelet-shaped substrates where each substrate has a thickness less than 100 nm.
4. A method according to claim 1, wherein the laser is a pulsed laser, a gas laser, or an excimer laser.
5. A method according to claim 4, wherein the laser is a Nd:YAG laser.
6. A laser-markable precursor, comprising a thermoplastic of a polyolefin, a polyamide, a saturated polyester, a polyester ester, a polyether ester, a polyphenylene ether, a polyacetal,

a polybutylene terephthalate, a polymethyl methacrylate, a polyvinyl acetal, a polystyrene, an acrylonitrile-butadiene-styrene, an acrylonitrile-styrene-acrylate, a polycarbonate, a polyether sulphone, a polyether ketone, a copolymer thereof, or a mixture thereof, and a high luster bismuth oxychloride, with the proviso that the thermoplastic is not an unsaturated polymer cross-linked with a styrene monomer.

7. A laser-markable precursor according to claim 6, wherein the thermoplastic is a polyethylene or polypropylene.

8. A laser-markable precursor according to claim 6, wherein the thermoplastic is a high density polyethylene.

9. A laser-markable precursor according to claim 6, wherein a lacquer drawdown comprising the high luster bismuth oxychloride has a luster index of greater than 50%.

10. A laser-markable precursor according to claim 6, wherein the high luster bismuth oxychloride comprises platelets having a thickness of no more than 90 nm.

11. A laser-markable precursor according to claim 6, wherein the high luster bismuth oxychloride comprises platelets having a thickness of no more than 70 nm.

12. A laser-markable precursor according to claim 6, wherein the high luster bismuth oxychloride comprises platelets having a thickness of about 60 nm.

13. A laser-markable precursor according to claim 6, wherein the loading of the high luster bismuth oxychloride in the thermoplastic is less than 5%.
14. A laser-markable precursor according to claim 6, wherein the loading of the high luster bismuth oxychloride in the thermoplastic is less than 0.3%.
15. A laser-markable precursor according to claim 6, wherein the loading of the high luster bismuth oxychloride in the thermoplastic is 0.1–0.25%.
16. A process for making a laser-marked article, comprising:
exposing a laser-markable precursor according to claim 6 to a pulse laser, a gas laser, or an excimer laser.
17. A process for making a composition for laser marking an article, comprising:
extruding a mixture of a high luster bismuth oxychloride with a thermoplastic of a polyolefin, a polyamide, a saturated polyester, a saturated polyester ester, a polyether ester, a polyphenylene ether, a polyacetal, a polybutylene terephthalate, a polymethyl methacrylate, a polyvinyl acetal, a polystyrene, an acrylonitrile-butadiene-styrene, an acrylonitrile-styrene-acrylate, a polycarbonate, a polyether sulphone, a polyether ketone, a copolymer thereof, or a mixture thereof.
18. A process for making a laser marked article, comprising exposing the composition made by the process according to claim 17, to a laser.

19. A process according to claim 18, wherein the laser is a Nd:YAG laser.

20. A laser marking additive, comprising:

a plurality of particles of at least one compound of the formula:



where M is, independently, As, Sb, or Bi; or

a compound of the formula BiONO_3 , $\text{Bi}_2\text{O}_2\text{CO}_3$, BiOOH , BiOF , BiOBr , $\text{BiOC}_3\text{H}_5\text{O}_7$, $\text{Bi}(\text{C}_7\text{H}_5\text{O}_2)_3$, BiPO_4 , and $\text{Bi}_2(\text{SO}_4)_3$; wherein a lacquer drawdown comprising the additive has a luster index of greater than 50%.

21. A laser marking additive according to claim 20, wherein the additive is a high luster bismuth oxychloride.

22. A method of laser-marking comprising exposing a substrate to a laser creating a laser-mark, said substrate comprising thereon an additive according to claim 20 and an organic additive which is an ethoxylated fatty amine or amide, an ethoxylated fatty alkyl quaternary amine, an ethoxylated di-fatty alkyl quaternary amine, a sodium stearate, an ethoxylated sorbitol ester of a fatty acid, a fatty alcohol quaternary amine, or a mineral oil with the proviso that the substrate is not an unsaturated polyester cross-linked with a styrene monomer thermosetting resin.

23. A method according to claim 22, wherein the ethoxylated fatty amine is a compound of the formula:



where: R^1 includes any fatty acid hydrocarbon from 8–22 C atoms, and

R^2 and R^3 are, independently, 1–25 units of $-CH_2CH_2O-$ where the last unit terminates in a hydrogen atom;

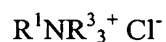
the ethoxylated fatty amide is a compound of the formula:



where: R^1 includes any fatty acid hydrocarbon from 8–22 C atoms, and

R^2 and R^3 are, independently, 1–25 units of $-CH_2CH_2O-$ where the last unit terminates in a hydrogen atom; or further comprising

a non-ethoxylated quaternary chloride salt of the formula:



where: R^1 includes any fatty acid hydrocarbon from 8–22 C atoms, and

R^4 is, independently, methyl, ethyl or propyl.

24. A laser marking additive according to claim 20 wherein the particles have all dimensions less than 5 microns.